

APPENDIX 4A

Data and Modeling Assumptions for Model Project Analysis

Table 4A-1. Model Parameters and Data Sources

Parameters	Single-family Residential		Multifamily Residential		Small Commercial (Shopping Center)		Industrial Building	
	Value	Data Source	Value	Data Source	Value	Data Source	Value	Data Source
Size of parcel	1, 3, 7.5, 25, 70, and 200 acres	EPA assumption	1, 3, 7.5, 25, 70, and 200 acres	EPA assumption	1, 3, 7.5, 25, 70, and 200 acres	EPA assumption	1, 3, 7.5, 25, 70, and 200 acres	EPA assumption
Cost of raw land	\$40,000 per acre	NAHB Chicago focus groups, based on experience of the Chicago-area participants. See Appendix B for further discussion.	\$40,000 per acre	NAHB Chicago focus groups, based on experience of the Chicago-area participants. See Appendix A for further discussion.	\$297,545 per acre	Urban Land Institute (ULI) Market Profiles 2000: North America. Median land cost for nonregional shopping centers (cost ranges for individual MSAs were averaged before taking the median)	\$137,500 per acre	Urban Land Institute (ULI) Market Profiles 2000: North America. Median land cost for industrial parks (cost ranges for individual MSAs were averaged before taking the median).
Average Lot Size	0.33 acres	Census Report C25 (Characteristics of New Housing, 1999) reports an average lot size for new single-family homes sold of 12,910 square feet, which represents a density of close to 3 lots per acre. (The median lot size is 8,750 square feet, which implies a density of almost 5 lots per acre).	N/A		N/A		N/A	
Approximate Density (number of lots per acre)	2.67	Calculated based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygons," to account for impervious surfaces not associated with individual lots. Total number of lots is rounded to nearest whole number.	N/A		N/A		N/A	

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Parameters	Single-family Residential		Multifamily Residential		Small Commercial (Shopping Center)		Industrial Building	
	Value	Data Source	Value	Data Source	Value	Data Source	Value	Data Source
Due diligence	\$2,500 per acre	Based on \$100,000 for a hypothetical 40-acre development discussed by the NAHB Chicago focus group participants. See Appendix B for further discussion.	\$2,500 per acre	See Single-family Residential Data Source for details.	\$2,500 per acre	See Single-family Residential Data Source for details.	\$2,500 per acre	See Single-family Residential Data Source for details.
Land development costs	\$25,000 per lot	Estimate from NAHB Chicago focus groups. This figure includes any construction activities related to land development (e.g. infrastructure costs).	\$75,000 per acre	Scaled estimate based on \$25,000 per lot from NAHB Chicago focus groups. This figure includes any construction activities related to land development (e.g. infrastructure costs).	\$75,000 per acre	Scaled estimate based on \$25,000 per lot from NAHB Chicago focus groups. This figure includes any construction activities related to land development (e.g. infrastructure costs).	\$75,000 per acre	See Small Commercial Data Source for details.
Engineering costs, as percent of land development costs	6%	Estimate from NAHB Chicago focus groups.	6%	Estimate from NAHB Chicago focus groups.	6%	Estimate from NAHB Chicago focus groups.	6%	Estimate from NAHB Chicago focus groups.
Overhead costs, as percent of development costs	10%	Estimate from NAHB Chicago focus groups.	10%	Estimate from NAHB Chicago focus groups.	10%	Estimate from NAHB Chicago focus groups.	10%	Estimate from NAHB Chicago focus groups.
Contingency, as percent of land development costs prior to impact fees	10%	Estimate from NAHB Chicago focus groups.	10%	Estimate from NAHB Chicago focus groups.	10%	Estimate from NAHB Chicago focus groups.	10%	Estimate from NAHB Chicago focus groups.
Impact fees	\$15,000 per lot	Estimate from NAHB Chicago focus groups. See Appendix B for further discussion.	\$45,000 per acre	Scaled estimate based on \$15,000 per residential lot from NAHB Chicago focus groups. See Appendix A for further discussion.	\$45,000 per acre	See Multifamily Data Source for details.	\$45,000 per acre	See Multifamily Data Source for details.

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Parameters	Single-family Residential		Multifamily Residential		Small Commercial (Shopping Center)		Industrial Building	
	Value	Data Source	Value	Data Source	Value	Data Source	Value	Data Source
Real estate and marketing fees, as percent of sales price of building	7%	Estimate from NAHB Chicago focus groups.	7%	Estimate from NAHB Chicago focus groups.	7%	Estimate from NAHB Chicago focus groups.	7%	Estimate from NAHB Chicago focus groups.
Average size of building	2,310 square feet	From Census Report C25, the average size of new single-family homes sold in 1999 and conventionally financed was 2,310 square feet.	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."
Cost of building construction	\$53.80 per sq.ft.	From NAHB's website, construction costs for a generic single-family house are \$124,276. $\$124,276 \div 2,310 = \53.80 . See Appendix B for further discussion.	\$54.05 per sq. ft.	R.S. Means Building Construction Cost Data median construction cost per square foot for a "typical" low-rise (1-3 stories) apartment building.	\$53.85 per sq.ft.	R.S. Means Building Construction Cost Data median construction cost per square foot for a "typical" supermarket	\$36.15	R.S. Means Building Construction Cost Data median construction cost per square foot for a "typical" industrial warehouse.
Total Paved Surface Area (Parking, Driveways, and Roads)	N/A		Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."
Paving Cost (Parking, Driveways, and Roads)	N/A		\$1.44 per sq. ft.	R.S. Means Heavy Construction Cost Data	\$1.44 per sq. ft.	R.S. Means Heavy Construction Cost Data	\$1.44 per sq. ft.	R.S. Means Heavy Construction Cost Data
Total Sidewalk Area	N/A		Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."	Varies	Scaled to site size based on impervious surface ratios from "Chesapeake Bay Watershed Impervious Cover Results by Land Use Polygon."

Table 4A-1. Model Parameters and Data Sources

Parameters	Single-family Residential		Multifamily Residential		Small Commercial (Shopping Center)		Industrial Building	
	Value	Data Source	Value	Data Source	Value	Data Source	Value	Data Source
Sidewalk Construction Cost	N/A		\$4.66 per sq. ft.	R.S. Means Heavy Construction Cost Data	\$4.66 per sq. ft.	R.S. Means Heavy Construction Cost Data	\$4.66 per sq. ft.	R.S. Means Heavy Construction Cost Data
Percent of total land cost that a developer can finance for land acquisition	65%	Loan-to-value ratio as written in the Real Estate Lending Rules. See Appendix B for further discussion.	65%	See Single-family Residential Data Source for details.	65%	See Single-family Residential Data Source for details.	65%	See Single-family Residential Data Source for details.
Percent of total land cost that a developer can finance for land development	70%	Loan-to-value ratio as written in the Real Estate Lending Rules. See Appendix B for further discussion.	70%	See Single-family Residential Data Source for details.	70%	See Single-family Residential Data Source for details.	70%	See Single-family Residential Data Source for details.
Percent of total building construction cost that a builder can finance	80%	Loan-to-value ratio as written in the Real Estate Lending Rules. See Appendix B for further discussion.	80%	See Single-family Residential Data Source for details.	80%	See Single-family Residential Data Source for details.	80%	See Single-family Residential Data Source for details.
Loan interest rate for builder/developer	7.5%	EPA estimate.	7.5%	EPA estimate.	7.5%	EPA estimate.	7.5%	EPA estimate.
Term of land acquisition loan, years	3	EPA assumption. Assumes that the land acquisition loan is paid off over the life of the project, which in this case is 3 years.	3	See Single-family Residential Data Source for details.	3	See Single-family Residential Data Source for details.	3	See Single-family Residential Data Source for details.
Term of land development loan, years	1	EPA assumption. Assumes that the land development loan term is equal to the length of the development phase of the project, which in this case is 1 year.	1	See Single-family Residential Data Source for details.	1	See Single-family Residential Data Source for details.	1	See Single-family Residential Data Source for details.

Table 4A-1. Model Parameters and Data Sources

Parameters	Single-family Residential		Multifamily Residential		Small Commercial (Shopping Center)		Industrial Building	
	Value	Data Source	Value	Data Source	Value	Data Source	Value	Data Source
Term of building construction loan, years	1	EPA assumption. Assumes that the construction loan term is equal to the length of the construction phase of the project, which in this case is 1 year.	1	See Single-family Residential Data Source for details.	1	See Single-family Residential Data Source for details.	1	See Single-family Residential Data Source for details.
Assumed pre-tax profit on land development	10%	NAHB Chicago focus group estimated 12-14 percent; 10 percent is an EPA assumption. See Appendix B for further discussion.	10%	See Single-family Residential Data Source for details.	10%	See Single-family Residential Data Source for details.	10%	See Single-family Residential Data Source for details.
Assumed pre-tax profit on construction	10%	NAHB Chicago focus groups estimated 8 to 12 percent pre-tax at time of sale. R.S. Means uses 10 percent as a profit assumption in their Cost Data book series.	10%	See Single-family Residential Data Source for details.	10%	See Single-family Residential Data Source for details.	10%	See Single-family Residential Data Source for details.

APPENDIX 4B

Detailed Description of Model Parameters and Assumptions

Cost of Raw Land

Land prices tend to vary by region of the country, and even within particular regions, depending on the exact location of the parcel (e.g., urban proximity). For this generic single-family project cost model, a value of \$40,000 per acre is used based on the estimate provided by participants in the Chicago NAHB focus group morning session. The participants in the NAHB Dallas focus group meetings confirmed that even within one state lot prices can range dramatically. Prices per lot were reported to range from near \$10,000 in El Paso, TX, to nearly \$1 million in Austin (for lake-front property). (Note, these costs cited were per lot, not per acre). The single-family development land cost estimate was also used in the multifamily residential project model due to lack of other data.

Land prices for the commercial and industrial models were taken from the Urban Land Institute's (ULI) Market Profiles 2000: North America, which lists average land costs for shopping centers and industrial parks for selected Metropolitan Statistical Areas (MSAs) depending on data availability. The median land cost for each project type was calculated from a list of MSA average land costs and used in the models as a national estimate proxy.

Due Diligence

As described previously, due diligence refers to the work done by the developer prior to taking ownership of a parcel. During this time the developer conducts a variety of environmental and engineering assessments to identify any potential obstacles to the successful completion of the proposed development. At this time the only estimates for due diligence costs are based on a \$100,000 estimate provided by the Chicago NAHB focus group participants for a 40-acre project. This figure was converted to \$2,500 per acre on the assumption that these costs would fluctuate depending on the size of the project.

Impact Fees

The NAHB's Chicago focus group estimated the impact fees on new residential construction to average \$15,000 per lot. This figure was converted to \$45,000 per acre for use in the multifamily, commercial, and industrial project models.

This is one of many estimates that may be found in the literature. In their book *Red Tape and Housing Costs*, Michael Luger and Kenneth Temkin interviewed numerous builders and developers in New Jersey and North Carolina, and received several estimates for impact fees in North Carolina. Estimates ranged from approximately \$2,800 to \$6,547 per unit in Cary, NC, and from \$1,300 to \$2,765 in Durham, NC. Even the highest estimate in these ranges is significantly lower than the estimate from the focus group meeting. These fees represent approximately 1 to 2 percent of the final sale price of a house in the area.

In a cost breakdown of a single-family home provided by NAHB on their website,³⁴ impact fees were estimated at \$1,182 per unit (approximately 1 percent of total construction cost). A study by the Sierra Club (Sierra Club 2000) estimates that impact fees range from under \$1,000 per unit to approximately \$6,140 per single-family unit. These figures are based on local observations. Finally, Ross and Thorpe (1992) report that a survey conducted in 1990 in Orange County, California (one of the most expensive housing markets in the country), found at least three cities in that county with impact fees exceeding \$20,000 per unit. This estimate is closest to the assumption currently in the models.

At this time, EPA is unaware of any single national estimate for the average impact fee imposed on developers and builders and has chosen to use the NAHB estimate for this analysis.

Building Construction Costs

The approach used in the model project for estimating average building construction costs for the single-family project is to take total construction costs for a new single-family house, provided by NAHB on their website (\$124,276) (NAHB 2001b), and divide that figure by the average square footage of a new, conventionally financed, house as reported by Census (2,310 square feet; Characteristics of New Housing). This calculation yields an average construction cost of \$53.80 per square foot. NAHB focus group participants estimated that building construction costs ranged from \$50 to \$75 per square foot, at least in the Chicago area. The national estimate is within the range provided by NAHB members at the focus group meeting.

³⁴ http://www.nahb.com/housing_issues/balance_2.htm

Building construction costs for the remaining projects – multifamily, commercial, and industrial – were taken from R.S. Means *Building Construction Cost Data*. The costs used were median costs for the “typical” sized building for each project type, based on the projects detailed in the R.S. Means project database. While the building costs may fluctuate some with overall building size, the median cost was used as a proxy for national-level building costs and was used regardless of site or building size. Building size for these three project types was assumed to fluctuate with site size. Size estimates for each site size were determined using the building to site area ratio from the Center for Watershed Protection. Multiplying this ratio by each site size (1, 3, 7.5, etc. acres) gave EPA an estimate of building footprint. Since multifamily building construction costs were based on low-rise apartment buildings 1 to 3 stories in height, an average of 2 stories per apartment building was used to calculate total building square footage from the footprint. Commercial and industrial buildings were assumed to be 1 story; therefore the building footprint equaled total building area.

Impervious Surface Estimates

Estimates for impervious surface area and construction costs were calculated for the multifamily, commercial, and industrial model projects. The impervious surface area for roads, driveways, parking, and sidewalks was calculated by multiplying the impervious surface area to site size ratio (CWP 2001) by the site size. R.S. Means cost estimates for paving and sidewalk construction were used to estimate impervious surface construction costs. The paving cost estimate (\$1.44 per square foot) was multiplied by the combined surface area for roads, driveways, and parking while the sidewalk cost estimate (\$4.66 per square foot) could be directly multiplied to the sidewalk surface area estimate.

Financing Requirements

A December 28, 1999, memo from ERG to EPA (“Real Estate Development Financing”) cites the typical land acquisition loan duration is 2 years, whereas the models currently use a duration of 3 years. It is not clear if the 2 year loan term includes the same activities as assumed for the model projects. Similarly, the duration for the land development loan is cited as approximately 2 years (comparable to that for the land acquisition loan). The average duration of the construction loan is not cited in the memo, although it may be assumed that the duration of the loan would vary with project size.

Loan-to-value ratios under the Real Estate Lending Rules declined from approximately 80 percent for all phases of project development to the following breakdown after the Savings and Loan Crisis:

- 65 percent for land acquisition
- 75 percent for land development
- 80 percent for construction

The memo also states that the typical land acquisition loan rate is 1-4 points above the prime rate. No further detail for the remaining project stages is given, but they are assumed to be within the same range. The models currently use a loan rate of 7.5 percent.

Profit Assumptions

Profit on both land development and building construction are assumed to be 10 percent, based on conversations with NAHB and reality-checked against the assumptions used in the R.S. Means Cost Data series. Note that there would not be a separate profit for the land development phase of the project because the developer-builder would retain ownership of the project through building construction (land development profit is only realized when a developer sells finished lots to individual builders). The profit rate with 100 percent CPT is based on the assumption that any additional costs incurred by the developer-builder (i.e., additional storm water control costs) would be passed through to the consumer, and that none of the additional costs would be borne by the developer-builder as decreased profit. The profit rate with zero CPT depends on the level of costs.

Overhead Assumptions

EPA assumes that developers apply an overhead charge to all costs incurred during the land development phase, and that a further overhead charge is levied by the builder on all costs incurred during the building phase, including the cost of lot acquisition. These overhead charges represent, in part, payment to the owner for capital tied up to secure development and construction loans as well as compensation for managing and overseeing the work of subcontractors and other professionals (engineers, architects, designers).

The estimated overhead rate of 10 percent at the development stage and 10 percent at the building phase was based on input from NAHB. EPA has separately calculated the “opportunity cost of capital” based on actual financing needs, loan conditions, and loan terms. In the model projects, therefore, the actual percentage applied as an overhead factor has been adjusted downwards.

APPENDIX 4C
Characteristics of Model Establishments

Table 4C-1. Model Establishment Characteristics Based on Census Data^[1]

	Class	Number of Establishments	Average Starts	Average Revenue	Average Employment	Cashflow
Single Family	1-4	17,107	2.3	\$492.2	2.5	\$46.3
	5-9	7,589	6.4	\$1,088.6	3.3	\$104.9
	10-24	6,262	14.6	\$1,987.0	4.3	\$177.3
	25-99	3,018	41.9	\$4,923.5	8.6	\$4,229.0
	100-499	833	191.7	\$24,030.7	32.1	\$2,187.6
	500+	122	864.5	\$109,032.6	160.0	\$9,192.5
Multifamily	2-9	486	4.3	\$644.8	3.2	\$29.4
	10-24	398	16.5	\$1,381.6	5.1	\$99.6
	25-99	383	55.1	\$3,499.7	8.0	\$320.1
	100-499	593	191.7	\$7,410.0	13.5	\$566.6
	500+	39	959.0	\$43,844.4	64.7	\$938.8
Commercial	50-99	41,356	13.2	\$23,799	67.5	\$927.5
Industrial	50-99	8,042	9.5	\$18,470	67.7	\$627.3

[1] Dollar values in thousands

Table 4C-2 Model Establishment Characteristics Based on Dun And Bradstreet Data

Line Item	Single Family (SIC 1531)		Multifamily (SIC 1522)		Commercial (SIC 1542)		Industrial (SIC 1541)	
	Scaled Value [1]	Percent	Scaled Value [1]	Percent	Scaled Value [1]	Percent	Scaled Value [1]	Percent
Cash	\$82,229	11.9%	\$55,752	18.4%	\$61,705	21.5%	\$57,682	19.1%
Accounts Receivable	\$61,499	8.9%	\$81,204	26.8%	\$101,598	35.4%	\$108,116	35.8%
Notes Receivable	\$4,837	0.7%	\$3,939	1.3%	\$2,009	0.7%	\$2,718	0.9%
Inventory	\$210,064	30.4%	\$12,726	4.2%	\$5,740	2.0%	\$4,530	1.5%
Other Current	\$152,711	22.1%	\$67,569	22.3%	\$60,270	21.0%	\$58,588	19.4%
Total Current Assets	\$511,340	74.0%	\$221,190	73.0%	\$231,322	80.6%	\$231,634	76.7%
Fixed Assets	\$109,178	15.8%	\$58,176	19.2%	\$41,041	14.3%	\$52,246	17.3%
Other Non-current	\$70,482	10.2%	\$23,634	7.8%	\$14,637	5.1%	\$18,120	6.0%
Total Assets	\$691,000	100.0%	\$303,000	100.0%	\$287,000	100.0%	\$302,000	100.0%
Accounts Payable	\$56,662	8.2%	\$73,023	24.1%	\$87,248	30.4%	\$79,124	26.2%
Bank Loans	\$11,747	1.7%	\$2,424	0.8%	\$1,435	0.5%	\$604	0.2%
Notes Payable	\$101,577	14.7%	\$18,483	6.1%	\$6,888	2.4%	\$7,248	2.4%
Other Current	\$196,935	28.5%	\$102,414	33.8%	\$52,521	18.3%	\$57,984	19.2%
Total Current Liabilities	\$366,921	53.1%	\$196,344	64.8%	\$148,092	51.6%	\$144,960	48.0%
Other Long Term	\$81,538	11.8%	\$29,997	9.9%	\$15,498	5.4%	\$22,348	7.4%
Deferred Credits	\$5,528	0.8%	\$1,212	0.4%	\$574	0.2%	\$302	0.1%
Net Worth	\$237,013	34.3%	\$75,447	24.9%	\$122,836	42.8%	\$134,390	44.5%
Total Liabilities & Net Worth	\$691,000	100.0%	\$303,000	100.0%	\$287,000	100.0%	\$302,000	100.0%
Net Sales	\$1,000,000	100.0%	\$1,000,000	100.0%	\$1,000,000	100.0%	\$1,000,000	100.0%
Gross Profit	\$228,000	22.8%	\$190,000	19.0%	\$159,000	15.9%	\$184,000	18.4%
Net Profit After Tax	\$12,000	1.2%	\$35,000	3.5%	\$30,000	3.0%	\$34,000	3.4%
Working Capital	\$144,419	--	\$24,846	--	\$83,230	--	\$86,674	--
Gross Profit Ratio		0.228		0.190		0.159		0.184
Return on Net Worth Ratio		0.051		0.464		0.244		0.253
Current Ratio		1.394		1.127		1.562		1.598
Debt to Equity Ratio		1.915		3.016		1.336		1.247

[1] Values scaled according to \$1,000,000 net sales for comparative purposes

Table 4C-3 Financial Ratio Data by Quartile

Sector	Ratio	Upper Quartile	Median	Lower Quartile
Single Family	Current	2.900	1.400	1.100
	Debt to Equity	0.724	1.796	4.928
	Return on Net Worth	0.335	0.168	0.066
Multifamily	Current	2.500	1.500	1.100
	Debt to Equity	0.595	1.280	3.179
	Return on Net Worth	0.589	0.227	0.061
Commercial	Current	2.200	1.500	1.200
	Debt to Equity	0.660	1.456	2.823
	Return on Net Worth	0.369	0.164	0.055
Industrial	Current	2.500	1.600	1.200
	Debt to Equity	0.527	1.300	2.723
	Return on Net Worth	0.386	0.151	0.055